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ARTICLE / ARTÍCULO

Theoretical Foundations for Higher Education Pedagogy with Generative Artificial Intelligence (AI): The DIDACT.IA Model

Bases teóricas para una didáctica universitaria con la Inteligencia Artificial (IA) generativa. El modelo DIDACT.IA

Manuel Area-Moreira

Abstract: Generative artificial intelligence (AI) in higher education is causing a pedagogical disruption that affects the meaning of academic tasks, assessment processes, teaching roles, and students' relationship with knowledge. Academic studies and publications have focused on describing instrumental uses, ethical risks, or digital competences, without sufficiently developing a didactic theory to guide the integration of AI into teaching and learning processes. This article aims to identify the theoretical foundations for university didactics with AI designed to foster the development of critical thinking. To this end, it adopts an integrative theoretical essay approach, bringing together contributions from distributed human-machine cognition, psychological and sociocultural approaches to critical thinking, and teaching theory. As a result, a conceptual framework is proposed for symbiotic learning, academic tasks as the instructional context of this interaction, and critical thinking as a condition for preserving students' epistemic agency. Finally, a didactic model, called DIDACT.IA, is presented, based on six dimensions: interrogation, comparison, critical dialogue, verification, personal reworking, and reflection. The article concludes that the model requires further empirical validation in different contexts of university teaching practice.

Keywords: Artificial Intelligence, Symbiotic Learning, Critical Thinking, Higher Education, Instructional Design, Academic Task.

Resumen: La inteligencia artificial (IA) generativa en la educación superior está provocando una disrupción pedagógica que afecta al sentido de las tareas académicas, a los procesos de evaluación, a las funciones docentes y a la relación del alumnado con el conocimiento. Los estudios y publicaciones académicas se han centrado en describir usos instrumentales, riesgos éticos o competencias digitales, sin desarrollar suficientemente una teoría didáctica que oriente la integración de la IA en los procesos de enseñanza y aprendizaje. Este artículo tiene como propósito identificar los fundamentos teóricos para una didáctica universitaria con IA orientada al desarrollo del pensamiento crítico. Para ello se adopta un enfoque de ensayo teórico de carácter integrador, articulando aportaciones de la cognición distribuida entre humano y máquina, los enfoques psicológicos y socioculturales del pensamiento crítico y la teoría de la enseñanza. Como resultado, se propone un marco conceptual para el aprendizaje simbiótico, las tareas académicas como contexto instruccional de dicha interacción, y el pensamiento crítico como condición para preservar la agencia epistémica del estudiante. Finalmente, se presenta un modelo didáctico, denominado «DIDACT.IA», basado en seis dimensiones: interrogación, comparación, diálogo crítico, verificación, reelaboración personal y reflexión. Se concluye que el mismo necesita mayor validación empírica en distintos contextos de la práctica docente universitaria.

Palabras-clave: Inteligencia Artificial, Aprendizaje Simbiótico, Pensamiento Crítico, Educación Superior, Diseño Instruccional, Tareas Académicas.

1. Introduction

In recent years, a large number of academic studies have been published on the impact, uses, opportunities, and risks of generative artificial intelligence (AI) in higher education (Crompton & Burke, 2023; Kasneci et al., 2023). In this regard, AI requires a reconsideration of several classic assumptions of university didactics: the relationship between information and knowledge, authorship in academic work, the nature of the task, the meaning of assessment, and the role of the teacher (Pérez-Gómez, 2024).

Current discourses oscillate between techno-pedagogical enthusiasm and moral alarm. In the first case, AI is presented as a resource for increasing efficiency, personalising learning, offering immediate feedback, supporting assessment, or automating certain teaching and administrative tasks (Lee et al., 2024; Xia et al., 2024; Francis et al., 2025). In the second, emphasis is placed on the risks of academic dishonesty, loss of authorship, the compromising of assessment validity, intellectual dependence, or impoverishment of critical thinking (Dawson et al., 2024; Kofinas et al., 2025; Bittle & El-Gayar, 2025). Both positions address troubling dimensions of the phenomenon, but they remain insufficient because they do not formulate a theory of teaching that establishes what learning should be promoted, through which tasks, with what forms of teacher mediation, according to which assessment criteria, and under what ethical principles in relation to AI.

The central problem addressed in this article is the absence of a sufficiently articulated didactic foundation to guide the use of AI in higher education from a critical, formative, and epistemologically grounded perspective. Its original contribution is to offer a theoretical framework that justifies a higher education pedagogical framework in the era of AI by integrating existing knowledge from different interdisciplinary fields whose shared concern is the primacy of the human subject in relation to machines, and by formulating practical prescriptions through the model called DIDACT.IA.

2. Approach and Method

This study takes the form of an integrative and purposeful theoretical essay. It does not present empirical research or the evaluation of a specific experience, but rather a proposal for theoretical articulation that makes it possible to explain and prescribe how AI may be incorporated into higher education teaching.

The starting point for this study can be found in an earlier work (Area-Moreira, 2025), in which a didactic model for critical thinking with AI was formulated on the basis of an analysis of real experiences in the context of university teaching (Area-Moreira & González-González, 2026). These works describe practical examples of how learning tasks and activities have been implemented by asking students to use AI tools according to the steps and dimensions of the model.

Building on these references, the procedure followed consisted of reviewing, selecting, and integrating contributions from different fields or traditions: human-machine interaction, instructional design, and psychological and sociocultural approaches to critical thinking. On the basis of this review, three axes were identified for constructing the proposal: the student as an epistemic agent through processes of symbiotic learning, the academic task as the central unit of didactic design, and critical thinking as the formative purpose of teaching with AI.

The bibliography used was selected according to three criteria: theoretical relevance for the axes of the model, the recency of the literature concerning generative AI and higher education, and each reference's capacity to support didactic implications regarding tasks, assessment, epistemic agency, and critical thinking. Integration was carried out through interpretive reading and conceptual comparison of the contributions, identifying convergences among pedagogical tradition, studies on human-machine interaction, and recent literature on educational AI.

Artificial intelligence tools were used in the preparation of this article with differentiated and complementary functions. ChatGPT was used to explore initial outlines of ideas, improve the wording, and review the formal suitability of the text in relation to the journal's requirements. Elicit and Perplexity were used to locate academic literature and obtain information from specialised databases. Notebook was used to organise sources and prepare content syntheses of the selected bibliography. In all cases, the contributions generated by these tools were reviewed, checked, and critically reworked, while the author retained intellectual responsibility for the selection of sources, the theoretical interpretation, and the final formulation of the didactic proposal.

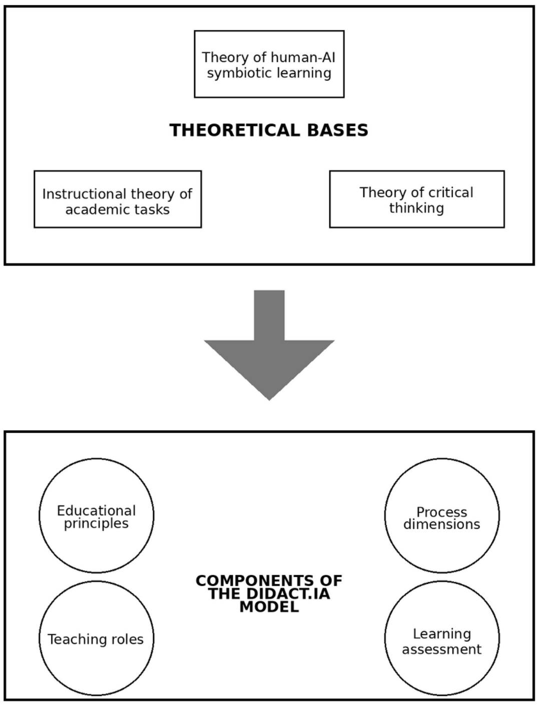

Figure 1. Theoretical bases and components for a didactics of teaching and learning with AI (DIDACT.IA Model).

This essay is organised into two parts or sections (see Figure 1). The first presents concepts drawn from the theoretical traditions of human-machine interaction, studies on critical thinking, and contributions from teaching theory.

The second part presents the translation of these theoretical developments into organised principles and dimensions for the design and development of didactic processes involving the use of AI in order to foster students' epistemic and critical capacity in relation to intelligent machines. This is the DIDACT.IA model.

3. Theoretical Foundations for Constructing a Didactics with AI

What are the theoretical references that justify and give meaning to a didactics with AI for students' critical thinking? The answer lies in the interrelation and integration of three approaches or fields of research and knowledge: cognitive symbiosis through human-machine interaction, the subject's critical thinking, and academic tasks as a learning context.

3.1. Theory of Human-AI Symbiotic Learning: The Student as Epistemic Agent

The symbiotic relationship between human beings and computers was proposed by Licklider (1960), who anticipated the possibility of close cooperation between human intelligence and computational systems, not oriented toward replacing the subject, but toward augmenting human capabilities to formulate problems, make decisions, and address complex situations. That foundational intuition has acquired renewed relevance today in the face of generative artificial intelligence, which is capable of producing answers, simulating dialogue, generating texts, and participating in processes of knowledge reworking.

From this perspective, generative AI cannot be understood solely as a passive tool that executes instructions, but rather as an artificial agent that intervenes in human cognitive activity. The concept of distributed cognition (Hutchins, 1995) indicates that cognition is not reduced to internal processes within an individual mind, but is distributed among subjects, artefacts, representations, languages, and activity environments.

The theory of the extended mind (Clark & Chalmers, 1998) suggests that certain external objects can be functionally integrated into a person's cognitive processes. A notebook, a calculator, a search engine, a database, or an AI system can act as external supports for memory, reasoning, representation, or symbolic production. What is decisive is not whether these artefacts are inside or outside the mind, but whether they participate significantly and functionally in a cognitive activity.

In this sense, AI can become an extension or amplification of the student's process of inquiry, analysis, writing, or revision. However, it acquires educational value only when the subject preserves the capacity to examine its responses critically, decide on their relevance, and assume final responsibility for the knowledge produced.

Likewise, 4E cognition approaches - embodied, embedded, enacted, and extended - conceive cognition as embodied, situated in material and social contexts, enacted through action, and extended through tools and artefacts (Newen, De Bruin, &

Gallagher, 2018). Learning with AI, from this position, does not mean passively receiving information generated by an algorithmic system, but participating in a situated activity in which the student interprets, decides, contrasts, reformulates, and produces knowledge in interaction with an artificial agent. Cognition emerges in the dynamic relationship among subject, tool, task, and context. Therefore, a didactics with AI should not focus only on the availability of intelligent applications for educational purposes, but on the design of learning situations that critically organise that relationship.

Another key concept is that of human epistemic agency (Coeckelbergh, 2026; Wu, Lee, Chai, & Tsai, 2025), understood as the subject's capacity to act responsibly in the construction, validation, and communication of knowledge. In contexts mediated by AI, epistemic agency is expressed in the student's capacity not to delegate to the machine the judgement of truth, relevance, or value of its responses, but to interrogate, contrast, verify, rework, and situate them within an ethical and academic framework of their own. It involves formulating relevant questions, selecting sources, justifying claims, recognising limits, revising beliefs, evaluating evidence, and assuming responsibility for what is stated.

Studies on an Epistemic Entanglement Framework (Samuel, 2026) also show that the use of AI in learning cannot be understood as a merely instrumental relationship, but rather as a form of epistemic entanglement in which practices of searching, validating, and producing knowledge are reconfigured between the learner and the machine. Vendrell and Johnston (2026), for their part, insist that AI must be integrated through pedagogical designs that preserve deliberation, verification, and critical reflection.

From my point of view, the concept that integrates all the preceding references is symbiotic learning, although it has not yet been sufficiently defined or used in the international literature. Morello and Chick (2025) have proposed Human-AI Symbiotic Theory as an approach to relations of functional interdependence between humans and AI systems in academic and research processes. Xie and Fang (2025) propose a symbiotic learning model for integrating AI into art and design education, highlighting collaboration between human creativity and algorithmic generation. Wu et al. (2025) likewise explicitly employ the notion of a symbiotic learning partnership to analyse how to preserve human epistemic agency in interaction with generative AI. Yang and Jiang (2024), in turn, have identified four key aspects for effective human-AI symbiosis: coexistence, evolution, asymmetry, and reciprocity.

In this essay, we define human-AI symbiotic learning as a process of knowledge construction in which the student interacts critically with intelligent systems in order to expand their possibilities for exploration, representation, contrast, production, and reflection, without delegating to the machine ultimate responsibility for judgement, understanding, and intellectual authorship. Symbiotic learning consists of regulated cognitive coupling in which AI acts as mediator, interlocutor, mirror, counterpoint, or cognitive prosthesis, while the student preserves and develops their epistemic agency. This idea comes close to the concept of hybrid intelligence or extended cognition, understood as the complementary combination of human and artificial intelligence to achieve outcomes superior to those that each could achieve separately (Dellermann, Ebel, Söllner, & Leimeister, 2019). It is also an assumption that connects with the hybrid human-AI learning technologies proposed by Molenaar (2022).

Consequently, a didactics with AI should aim for students to learn to establish symbiotic relationships with intelligent systems. This means teaching them to use the machine not as a substitute for intellectual effort nor as a device responsible for carrying out academic tasks, but as a means of expanding, analysing, contrasting, and problematising thought. In this regard, Pietarinen and Shi (2026) propose three guiding principles for students' use of AI: moral legitimacy (when AI influence enters the dark side of manipulation or deception), developmental integrity (how tools support, rather than replace, reflective judgement and imaginative work), and value preservation (protecting epistemic agency and intellectual virtues).

The DIDACT.IA model is grounded precisely in this conception. Its six dimensions - interrogation, comparison, critical dialogue, verification, personal reworking, and reflection - seek to turn interaction with AI into a valuable experience for developing students' competence as epistemic agents. The purpose is not for students to think less because they have a machine that produces answers, but for them to learn to think better by being compelled to formulate more precise questions, contrast arguments, identify biases, check evidence, reconstruct meanings, and reflect on their own learning process.

3.2. Theory of Critical Thinking and the Cognitive Processes Involved

The second foundation for a didactics with AI, closely linked to the concepts of epistemic agency and symbiotic learning, is critical thinking. Its importance goes back to the Greek philosophers as a basis for constructing the identity of the subject and the active citizen. In the current age of informational abundance and automated production of responses, educational value does not lie in accessing information, but in knowing how to question it, interpret it, evaluate it, and transform it into one's own knowledge.

Authors such as Ennis (1985), Paul and Elder (2006), Facione (1990), and Bailin (2002) have linked critical thinking to the capacity to make reasoned judgements, evaluate arguments, analyse evidence, identify assumptions, and act with a reflective disposition. From cognitive psychology, critical thinking is related to reasoning skills, problem solving, transfer, metacognition, and regulation of judgement. From sociocultural perspectives, critical thinking is not only an individual skill, but a practice situated in discourse communities, traversed by languages, norms, values, power relations, and shared criteria of validation. In this regard, it is necessary to recall the extensive bibliography of Paulo Freire on this matter.

In cognitive terms, critical thinking involves operations such as interpreting information, analysing argumentative structures, comparing perspectives, inferring consequences, evaluating evidence, detecting contradictions, identifying biases, formulating questions, justifying conclusions, and making reasoned decisions. In metacognitive terms, it requires monitoring one's own thinking process, recognising uncertainties, revising beliefs, distinguishing between understanding and repetition, and assessing the quality of one's own performance. In attitudinal terms, it requires intellectual openness, epistemic humility, willingness to doubt, honesty, perseverance, a search for evidence, and responsibility for the consequences of what is stated.

Generative AI can produce fluent, structured, and apparently sound responses, but it does not possess epistemic responsibility in the human sense. It may invent references, reproduce biases, homogenise perspectives, conceal uncertainties, or present arguments of different strength as if they were equivalent. For this reason, a didactics with AI cannot be limited to teaching "good prompts"; it must educate subjects capable of exercising critical judgement about the products of the machine.

Epistemic agency and critical thinking are complementary dimensions of learning: agency gives the student the responsibility and capacity to act as an epistemic subject, while critical thinking provides the cognitive and discursive tools needed to evaluate, justify, and transform knowledge rigorously.

In other words, critical thinking is what enables the student not to become alienated by the generative power of AI. Without critical thinking, the human-machine relationship tends to become one of dependence: the student requests, receives, copies, adapts superficially, and submits. With critical thinking, the relationship can become symbiotic learning: the student asks, contrasts, discusses, verifies, transforms, and assumes intellectual authorship of the outcome. Therefore, a didactics with AI must have as a permanent educational goal that students learn to develop critical thinking in their relationship with AI and with the products it generates.

Ultimately, critical thinking is what enables the student to maintain agency and cognitive autonomy in the symbiotic relationship with the machine. AI can generate information, suggest options, and produce texts, but it cannot judge, question, or assume responsibility for the knowledge it produces. It is the student who, through critical thinking, evaluates the quality of what AI generates, contrasts sources, detects biases, and constructs their own understanding. Critical thinking represents the most relevant formative goal of the DIDACT.IA model.

3.3. Instructional Theory: Academic Tasks

The third theoretical basis for a didactics with AI comes from theories of teaching and, specifically, from instructional design. The incorporation of AI does not eliminate the need to design teaching intentionally; on the contrary, it intensifies it. When students have access to tools capable of producing texts, solving problems, or generating explanations, the teacher must design tasks that cannot be reduced to the mere acquisition of an answer. The central didactic question ceases to be "what product should the student submit?" and becomes "what intellectual processes must the student activate in order to construct that product critically?"

The tradition of systemic instructional design, represented by authors such as Gagné, Merrill, Reigeluth, Romiszowski, and Bloom, provides valuable principles for this reconstruction. Gagné (1985) stressed the importance of organising the internal and external conditions of learning, sequencing instructional events, and attending to different types of outcomes. Bloom and his collaborators proposed a taxonomy of educational objectives that makes it possible to differentiate levels of cognitive complexity, from remembering and understanding to analysis, evaluation, and creation. Merrill (2002) formulated his first principles of instruction around the resolution of real problems, the activation of prior knowledge, demonstration, application, and integration. Reigeluth (1999) insisted on the need for instructional theories sensitive to the complexity of contexts, and Romiszowski (1981) provided criteria for relating objectives, strategies, media, and assessment.

However, for a didactics with AI, Walter Doyle's (1983) concept of the academic task is especially relevant. Doyle conceived tasks as central structures of classroom life that organise academic work, define expected products, regulate cognitive operations, and condition the way students process content. Doyle and Carter (1984) described a task as including, among other elements, a final product, available resources, operations to be carried out, and assessment conditions. They also pointed out that tasks are embedded in systems of risk, ambiguity, and valuation, so that students learn not only content, but also ways of interpreting what counts as legitimate and successful work in the classroom.

If a task is limited to requesting a generic essay, a documentary synthesis, or an explanatory response, the student can delegate much of the process to an AI system. But if the task requires the student to formulate their own questions, compare responses from different systems, justify decisions, verify sources, document the process, rework the outcome in their own voice, and reflect on errors and biases, then AI ceases to be a shortcut and becomes an object of cognitive work.

The academic task should be considered the central axis of instructional design with AI because it provides a situational ecology for learning. It articulates content, goals, resources, interactions, quality criteria, products, and assessment processes. There is no critical learning with AI unless there are carefully designed tasks that compel students to make their thinking visible.

Different types of academic tasks with AI can be distinguished: a) exploration tasks, aimed at formulating questions, delimiting problems, and generating hypotheses; b) comparison tasks, focused on contrasting responses from different tools or models; c) verification tasks, aimed at checking accuracy, currency, biases, and evidence; d) production tasks, oriented toward producing texts, projects, designs, or solutions with AI support; e) argumentation tasks, centred on defending one's own position against alternatives; f) metacognitive tasks, aimed at reconstructing the process followed, identifying decisions, and assessing learning; and g) ethical tasks, oriented toward analysing social implications, authorship, transparency, privacy, and justice.

The minimum components of an academic task with AI should include: formative purpose, initial problem or situation, expected product, documented process, permitted tools, criteria for ethical use, sources for contrast, expected cognitive operations, evidence of the process, assessment criteria, and final reflection. From this perspective, a didactics with AI must propose complex, rich, and varied tasks so that students activate processes of analysis, comparison, inference, argumentation, judgement, creation, and self-regulation, while being required to provide evidence of these processes.

This conceptualisation of the academic task can also be enriched by activity theory, which makes it possible to understand the task not as an isolated instruction, but as part of an activity system composed of subjects, objects, instruments, rules, community, and division of labour (Engeström & Sannino, 2021). From this sociocultural perspective, academic tasks mediated by AI configure an ecology of activity in which student, teacher, algorithmic tool, assessment criteria, and disciplinary culture interact. Along similar lines, the Activity-Centred Analysis and Design (ACAD) approach emphasises that design for learning does not directly prescribe what students learn, but configures tasks, resources, spaces, and relationships to foster valuable activities (Goodyear, Carvalho, & Yeoman, 2021).

4. The DIDACT.IA Model

A didactics with AI must respond to at least four questions: what educational principles should guide its use; what instructional methods and strategies make it possible to activate valuable learning; how the process, and not only the product, should be assessed; and what teaching roles emerge in this new scenario. These questions make it possible to shift the focus from technology to teaching, from the tool to the task, and from automation to the formation of judgement.

4.1. The Educational Principles of the DIDACT.IA Model

University didactics with AI should be grounded in a set of principles derived from the theories discussed above, which can be specified in the following ideas:

- Centrality of human agency. AI must be at the service of learning and must not replace the student's cognitive responsibility. Every use of AI should strengthen students' capacity to decide, argue, verify, and produce their own knowledge.

- Critical thinking. The learning objective is not to generate formally correct products, but to promote understanding, analysis, transfer, and critical judgement.

- Transparency and traceability. Students must declare what tools they have used, for what purpose, what instructions they formulated, what responses they obtained, and how they transformed them.

- Epistemological verification. No AI-generated product should be assumed to be valid without contrast with academic sources, data, evidence, or expert criteria.

- Responsible authorship. The final production must express the student's understanding, position, and voice. AI may collaborate in the process, but it must not replace intellectual authorship.

- Ethics and justice. The use of AI must consider bias, privacy, intellectual property, accessibility, sustainability, and social effects.

- Metacognition. Learning with AI requires reflection on how learning took place, what decisions were made, what errors appeared, and what limitations the tool had.

These principles make it possible to avoid two forms of reductionism: prohibitionism, which ignores the cultural transformation produced by AI, and technological solutionism, which naively trusts in the tool's capacity to improve education automatically.

4.2. Instructional Strategies: Dimensions of the Model

The didactic strategy consists of designing academic tasks that require students to interact critically with AI. To this end, the teacher must plan situations in which the tool is not a shortcut, but an object of analysis, contrast, and reworking. Examples of tasks would include: analysing a scientific controversy by comparing responses from several AI systems; producing a critical essay by verifying the claims generated by the machine; designing a didactic proposal by contrasting AI suggestions with academic literature; reviewing biases in explanations produced by different systems; or constructing one's own argumentation on the basis of a sustained dialogue with AI. For example, in a university course, students might ask two AI systems for an explanation of a complex concept, compare both responses, identify omissions or errors, contrast them with academic sources, rework their own synthesis, and submit a brief metacognitive report on the decisions taken. In another task, they might ask AI for arguments for and against an educational controversy, verify the solidity of the cited sources, and finally construct a justified personal position.

The DIDACT.IA model starts from the premise that the educational use of AI should be oriented toward the development of critical thinking through complex academic tasks in which students interact with intelligent systems while retaining responsibility for the knowledge process. This process of student-AI interaction in each academic task should be organised around six process dimensions: interrogation, comparison, critical dialogue, verification, personal reworking, and reflection. These dimensions should not be understood as rigid steps, but as recurrent actions that can be flexibly combined according to the nature of the task (see Figure 2).

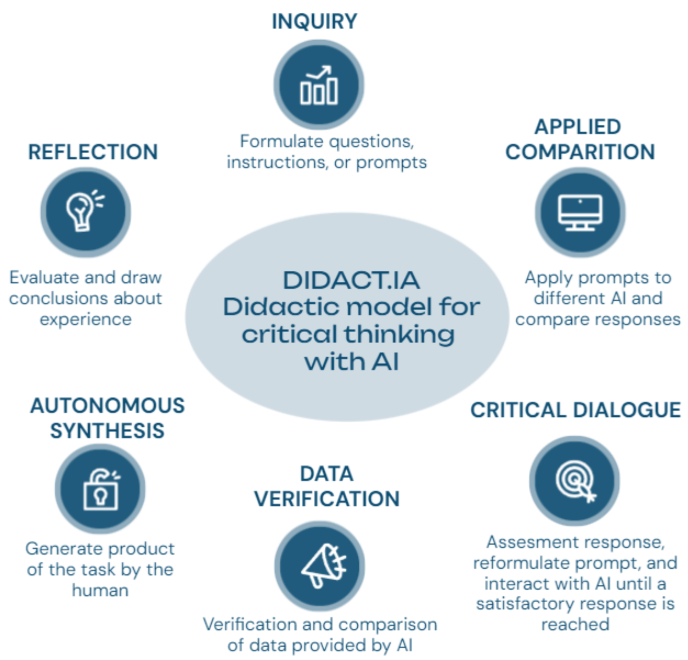

Figure 2. Didactic model for critical thinking with AI (Area-Moreira, 2025).

1) Inquiry. The student learns to formulate relevant, precise, and open questions. It is not merely a matter of writing effective prompts, but of transforming a need for knowledge into an intellectually meaningful request. Interrogation involves delimiting the problem, making the context explicit, requesting criteria, asking for alternatives, and anticipating possible biases.
2) Comparison. Students contrast responses generated by different tools, by different prompts, or by academic sources. Comparison makes it possible to detect differences in approach, omissions, errors, biases, and levels of depth. This dimension activates analysis, classification, discrimination, and judgement.
3) Critical dialogue. The student does not passively accept the first response, but engages in dialogue with AI: asking for clarification, questioning claims, requesting evidence, introducing counterarguments, and reformulating instructions. Critical dialogue turns interaction into an iterative process of refinement.
4) Verification. Every response must be checked against reliable sources. Verification involves seeking evidence, checking data, reviewing references, distinguishing facts from interpretations, and evaluating the quality of sources. It is an essential dimension for avoiding epistemic dependence on the machine.
5) Autonomous synthesis. The student reconstructs knowledge in their own words, structure, and position. They do not merely edit an AI-generated text, but integrate contributions, discard errors, reorganise ideas, and produce a discourse of their own.
6) Reflection. Finally, students analyse the process followed: what they learned, how their understanding changed, what AI contributed, what limitations they encountered, what decisions they made, and how they would evaluate the quality of their own work. This dimension activates metacognition and ethical awareness.

These six dimensions make it possible to transform the use of AI into a formative practice oriented toward critical thinking. AI ceases to be a source of answers and becomes a problematic interlocutor that demands judgement, control, and responsibility.

4.3. Assessment of Learning: Assessing Processes, Not Only Products

Generative artificial intelligence requires a reconsideration of learning assessment. For decades, many assessment practices have relied on the assumption that the product submitted by the student - an essay, a report, a problem solution, a programme, an exam, a presentation, or a documentary synthesis - expressed with reasonable fidelity their knowledge, capacities, and intellectual effort. However, when such products can be generated, corrected, expanded, or stylistically improved by AI systems, the relationship between final production and real learning becomes more fragile. The question is not merely to determine whether or not students have used an AI tool, but to ask what evidence makes it possible to assess whether they have understood, contrasted, decided, reworked, and responsibly assumed the knowledge they present.

The assessment proposed by the DIDACT.IA model should attend to at least three complementary planes. The first is the product, which remains important and should be assessed according to its conceptual rigour, argumentative coherence, expressive quality, appropriate use of evidence, suitability to purpose, and originality in the construction of discourse. The second is the process, understood as the set of actions through which the student has interacted with AI: initial interrogation, comparison of responses, critical dialogue, verification of information, revision of drafts, and reworking decisions. The third is metacognition, that is, the student's capacity to explain what they have learned, how they learned it, what role AI played, what limitations they detected in its responses, and what criteria they used to accept, reject, or transform its contributions.

This metacognitive dimension is especially relevant in interaction with generative systems. Tankelevitch et al. (2024) have pointed out that AI imposes new metacognitive demands on users, who must constantly monitor and regulate the quality of instructions, the reliability of outputs, and the degree of dependence on the tool. Translated into higher education, this means that assessing learning with AI also involves assessing students' capacity to exercise control over their own thinking: recognising uncertainties, detecting biases, identifying insufficiencies in generated responses, revising their decisions, and calibrating the trust placed in the machine.

This perspective coincides with recent proposals calling for more transparent and graduated frameworks for integrating AI into assessment. Perkins et al. (2024), through the Artificial Intelligence Assessment Scale, propose differentiating levels of permitted AI use according to the intended learning outcomes, avoiding both indiscriminate prohibition and uncritical acceptance. This logic is consistent with DIDACT.IA: in some tasks it may be pedagogically necessary to limit the use of AI; in others, to incorporate it explicitly as an object of analysis; and in others, to allow it as support for production, provided that evidence of process and intellectual responsibility is required.

In synthesis, the DIDACT.IA model proposes assessing not only what the student submits, but also the reconstruction of the process followed in producing it and the reflection on that experience. The central assessment question ceases to be whether the student "has used AI" and is instead formulated in more pedagogical terms: "How has AI been used? For what purpose? According to what criteria? What has been contrasted? What has been corrected? What has been reworked? What has the student learned about the content and about their own way of thinking?" Only when assessment incorporates these questions can it become a practice consistent with a didactics oriented toward critical thinking in the age of artificial intelligence.

4.4. The Role or Functions of Teachers in the Face of AI

It is evident that teacher professionalism must also be redefined in the face of AI. UNESCO (2024) has underlined this orientation by proposing an AI competency framework for teachers organised around a human-centred mindset, AI ethics, AI foundations and applications, AI pedagogy, and professional development. Along these lines, Chan (2024) warns that generative AI should not be conceived as a substitute for teachers, but as a technology with which educators must coexist and collaborate, while preserving those specifically human qualities linked to judgement, creativity, contextual sensitivity, and the educational relationship.

This transformation requires new forms of teacher professional development and competence. It is not enough to train teachers in the technical use of AI applications or in the writing of instructions or prompts. It is necessary to promote an expanded pedagogical competence that integrates technological understanding, didactic judgement, ethical sensitivity, and capacity for curricular redesign. The review by Tan et al. (2025) shows precisely that teachers' educational use of AI is closely linked to their training opportunities, professional needs, and the institutional conditions that favour or limit its pedagogical integration. The decisive question is not whether the teacher knows how to use a specific tool, but whether they have criteria for deciding when, how, for what purpose, and within what limits it should be incorporated into teaching.

The teaching role in relation to AI also has an indispensable ethical dimension. Teachers must establish clear frameworks for transparency, authorship, privacy, equity, and responsible use. They must also help students understand that uncritically delegating intellectual work to a machine is not only a problem of academic integrity, but also a renunciation of one's own epistemic agency.

It should also be noted that proposals are being developed that update the TPACK model in order to incorporate the specificity of AI into teachers' professional knowledge, such as AI-TPACK (Karataş & Ataç, 2025), HCAP (Chiu, 2026), or AIA-PCEK (Mimoudi & Mokhtari, 2025). These contributions are valuable because they situate AI within teachers' technological, pedagogical, disciplinary, ethical, and competence-related knowledge. However, DIDACT.IA differs from them in that its main object is not to describe the professional teaching knowledge required to teach with AI, but to propose a didactic architecture centred on student activity and on the sequence of operations that make it possible to transform interaction with AI into critical thinking and epistemic agency: interrogating, comparing, engaging in critical dialogue, verifying, reworking, and reflecting.

Ultimately, AI does not necessarily impoverish the teaching function, but it does render obsolete a conception of teaching based on the mere transmission of information and the assessment of closed products. Teacher professionalism is thus redefined as a practice of design, mediation, assessment, and ethical guidance aimed at enabling students to learn to think with AI, against AI when necessary, and always beyond it.

5. Conclusions and Practical Implications

Generative artificial intelligence is modifying the cultural, cognitive, and pedagogical conditions of higher education. Its presence requires a reconsideration of university didactics because it transforms the relationship among student, knowledge, task, assessment, and teaching. This article has argued that a didactics with AI cannot be limited to regulating the instrumental use of a new technology, but must be built on a pedagogical foundation capable of guiding its integration into teaching-learning processes. To this end, three theoretical axes have been proposed: human-machine interaction understood as symbiotic learning, instructional design centred on academic tasks, and critical thinking as both a formative goal and a condition of students' epistemic agency.

Symbiotic learning makes it possible to understand that AI can expand students' cognitive capacities provided that they retain critical control over the process. The academic task constitutes the central unit of didactic design because it organises intellectual activity, defines expected products, regulates cognitive operations, and establishes assessment conditions. Critical thinking, for its part, acts as a formative axis because it enables students not to become subordinated to the apparent cognitive authority of the machine. In this sense, the educational use of AI should not be oriented toward reducing intellectual effort, but toward enriching it, problematising it, enhancing metacognitive awareness..

In the DIDACT.IA model, the aim is for the student to become an epistemic agent capable of directing their interaction with AI. The student interrogates it, compares it, engages in critical dialogue with it, verifies its responses, personally reworks its contributions, and subjects the entire process to reflection. These six dimensions offer a structure for designing university tasks in which AI is not used as an easy solution to academic demands, but as a supporting technology for developing complex cognitive and metacognitive processes. Understood in this way, AI does not replace students' intellectual activity, but becomes a means of expanding it, contrasting it, and subjecting it to examination.

The practical implications of this approach are relevant for university teaching. First, it requires a revision of the design of academic tasks, avoiding activities that can be easily delegated to AI and promoting proposals that require inquiry, contrast, argumentation, decision-making, personal reworking, and metacognitive reflection. Second, it implies transforming assessment by shifting the emphasis from the final product to the process of knowledge construction. Assessing in AI-mediated contexts entails attending to the questions formulated, the prompts used, the responses obtained, the sources contrasted, the decisions to modify, and the critical awareness that the student develops regarding their own learning. Third, it calls for a redefinition of the teaching role: teachers must act as designers of learning ecologies, epistemological mediators, guides of human-AI dialogue, assessors of processes, and ethical guarantors of the academic use of these technologies.

The DIDACT.IA model also has institutional implications. Universities need to develop clear guidelines on the use of AI in teaching, not only from the perspective of academic integrity, but also from that of curricular innovation, formative assessment, and the development of students' critical competence. Course syllabi should explicitly state when, how, and for what purpose AI may be used, what evidence of the process must be provided, and what criteria will be used to assess authorship, transparency, and the quality of learning. Likewise, teacher training must go beyond the technical learning of tools and focus on didactic design, pedagogical mediation, process assessment, and ethical reflection on artificial intelligence.

The main limitation of this work is its theoretical nature. Although the model has been implemented in some university teaching situations, empirical research will be necessary to analyse the application of the DIDACT.IA model in different disciplines, degree programmes, and levels of student experience, as well as to evaluate its effects on the development of critical thinking, intellectual autonomy, and epistemic agency. This is the purpose of the research project PID2024-157674NB-I00, currently under development, from which this article derives. It will also be necessary to study how forms of human-AI interaction vary according to the type of task, the tool used, academic culture, assessment criteria, and university contexts. Similarly, future research should explore teachers' and students' perceptions of the model's feasibility, the difficulties of its implementation, and its possible adaptations to face-to-face, hybrid, and virtual environments.

In short, the framework proposed by the DIDACT.IA model offers a solid conceptual basis for advancing toward a university didactics capable of responding to the disruption generated by AI without renouncing the deepest purpose of higher education: to educate subjects capable of thinking, judging, creating, and acting autonomously and critically in relation to knowledge.

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